

## Section C

1.) degree 4  $\rightarrow$  highest exponent would be 4

$$\therefore y = A(x \quad)(x \quad)(x \quad)(x \quad)$$

fill in roots

$$y = A(x+2)(x-2)(x+1)(x+1)$$

Simplify:

$$y = A(x+2)(x-2)(x+1)^2$$

to find A: sub in (0;3)

$$-3 = A(0+2)(0-2)(0+1)^2$$

$$-3 = A(-4)$$

$$\frac{-3}{-4} = A \quad \Rightarrow \quad A = \frac{3}{4}$$

$$\therefore y = \frac{3}{4}(x+2)(x-2)(x+1)^2$$

2.)  $\frac{x^2 - 4x + 3}{x^2 - 1}$  factor!

$$\frac{(x-3)(x-1)}{(x+1)(x-1)}$$

$$\begin{array}{l} \text{V.A.} \\ x+1 \neq 0 \\ x \neq -1 \end{array}$$

$$\begin{array}{l} \text{H.A.} \\ y=1 \end{array}$$

because you can cancel  
(x-1)'s there is a  
hole when  $x-1=0$   
 $x=1$

3.) lots of solutions here

$$\frac{x}{(x-b)(x+8)} \quad \text{OR} \quad \frac{(x+b)(x-4)(x-b)}{(x+b)(x+8)(x-b)} \quad \text{or} \dots$$

4.)  $x^4 + x^3 - 7x^2 - x + 6 = f(x)$

$$f(1) = 1^4 + 1^3 - 7(1)^2 - 1 + 6 \\ = 0$$

$\therefore x-1$  is a factor

$$\begin{array}{r|rrrrr} 1 & 1 & 1 & -7 & -1 & 6 \\ & \downarrow & & & & \\ & 1 & 2 & -5 & -6 & 0 \end{array}$$

now we factor  $x^3 + 2x^2 - 5x - 6$

$$f(2) = 2^3 + 2(2)^2 - 5(2) - 6 \\ = 0$$

$\therefore x-2$  is a factor

$$\begin{array}{r|rrrr} 2 & 1 & 2 & -5 & -6 \\ & \downarrow & & & \\ & 1 & 4 & 3 & 0 \end{array}$$

now we factor  $x^2 + 4x + 3$

M: 3

A: 4

$$(x+3)(x+1)$$

$$\therefore f(x) = (x-1)(x+1)(x-2)(x+3)$$

$$g(x) = x^4 - 27x^2 - 14x + 120$$

$$g(2) = 2^4 - 27(2)^2 - 14(2) + 120$$

$$= 0$$

$\therefore x-2$  is a factor

\* don't forget  
placeholder  
for  $x^3$

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -27 & -14 & 120 \\ & \downarrow & 2 & 4 & -46 & -120 \\ \hline & 1 & 2 & -23 & -60 & 0 \end{array}$$

now we need to factor  $x^3 + 2x^2 - 23x - 60$

$$g(5) = 5^3 + 2(5)^2 - 23(5) - 60$$

$$= 0$$

$\therefore x-5$  is a factor

$$\begin{array}{r|rrrr} 5 & 1 & 2 & -23 & -60 \\ & \downarrow & 5 & 35 & 60 \\ \hline & 1 & 7 & 12 & 0 \end{array}$$

now we need to factor  $x^2 + 7x + 12$

$$(x+3)(x+4)$$

$$\therefore g(x) = (x-2)(x-5)(x+3)(x+4)$$

$$5) \frac{x+8}{x-5} \leq 2x+1$$

Remember - You cannot multiply both sides by  $x$ !

$$\frac{x+8}{x-5} - 2x+1 \leq 0$$

$$\frac{x+8 - (x-5)(2x+1)}{(x-5)} \leq 0$$

$$\frac{x+8 - (2x^2 - 9x - 5)}{x-5} \leq 0$$

$$\frac{x+8 - 2x^2 + 9x + 5}{x-5} \leq 0$$

$$\frac{-2x^2 + 10x + 13}{x-5} \leq 0$$

numerator not factorable but y-int is 13 and  $a = -2$  so it opens down.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_1 = -1.071 \quad \text{and} \quad x_2 = 6.071$$

Check around zeros & V.A.

$$\underline{\quad -1.071 \quad \quad 5 \quad \quad 6.071 \quad}$$

Our interval chart

	$x < -1.071$	$-1.071 \leq x \leq 5$	$5 < x \leq 6.071$	$x > 6.071$
$-2x^2 + 10x + 13$	—	+	+	—
$x - 5$	—	—	+	+
Total	+	—	+	—

out of range

$\leq 0$  means negative

$$\therefore -1.071 \leq x < 5 \text{ and } x \geq 6.071$$

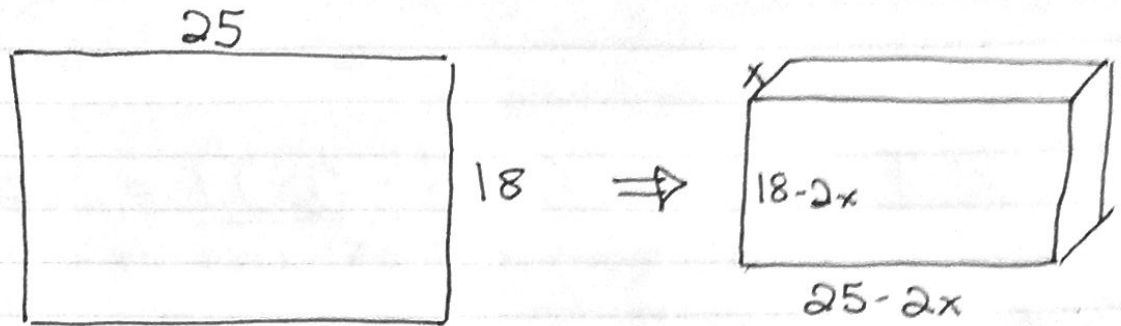
6.)  $2x^4 + x^3 - 14x^2 + 5x + 6 = 0$

factor using long or synthetic division

$$x = -3, -\frac{1}{2}, 1, 2$$



7.)



$$\begin{aligned}
 V &= Lwh \\
 &= (25-2x)(18-2x)(x) \\
 &= (450 - 50x - 36x + 4x^2)(x) \\
 &= 450x - 86x^2 + 4x^3
 \end{aligned}$$

$$\therefore 4x^3 - 86x^2 + 450x < 189$$

$$4x^3 - 86x^2 + 450x - 189 < 0$$

not easily factorable...

$$x = 13.32, 7.7 \text{ or } 0.46?$$

try graphing in desmos

## Section D

$$1.) \text{ AROC} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

$$= \frac{[-4.9(2)^2 + 4(2) + 0.1] - [-4.9(1.5)^2 + 4(1.5) + 0.1]}{2 - 1.5}$$

$$= \frac{-11.5 - (-4.925)}{0.5}$$

$$= \frac{-6.575}{0.5}$$

$$= -13.15 \frac{\text{m}}{\text{s}}$$

this means the ball is descending

$$2 a.) (f+g)(x) = 4x^2 - 3x + \frac{4}{2x-7}$$

$$= \frac{4x^2(2x-7) - 3x(2x-7) + 4}{2x-7}$$

$$= \frac{8x^3 - 28x^2 - 6x^2 + 21x + 4}{2x-7}$$

$$= \frac{8x^3 - 34x^2 + 21x + 4}{2x-7}$$

$$b.) g(f(x)) = \frac{4}{2(4x^2-3x)-7}$$

$$= \frac{4}{8x^2-6x-7}$$

$$c.) (f-g)(x) = 4x^2 - 3x - \left(\frac{4}{2x-7}\right)$$

$$= 4x^2 - 3x - \frac{4}{2x-7}$$

$$= \frac{4x^2(2x-7) - 3x(2x-7) - 4}{2x-7}$$

$$= \frac{8x^3 - 28x^2 - 6x^2 + 21x - 4}{2x-7}$$

$$= \frac{8x^3 - 34x^2 + 21x - 4}{2x-7}$$

$$d.) f(g(x)) = 4\left(\frac{4}{2x-7}\right)^2 - 3\left(\frac{4}{2x-7}\right)$$

$$= 4\left(\frac{16}{4x^2-28x+49}\right) - \frac{12}{2x-7}$$

$$= \frac{64}{(2x-7)^2} - \frac{12}{2x-7}$$

\* usually simpler  
not to expand  
denom

$$= \frac{64 - 12(2x-7)}{(2x-7)^2} \Rightarrow \frac{-24x - 20}{(2x-7)^2}$$



$$e) f(x)g(x) = (4x^2 - 3x) \cdot \left(\frac{4}{2x-7}\right)$$

$$= \frac{16x^2}{2x-7} - \frac{12x}{2x-7}$$

$$= \frac{16x^2 - 12x}{2x-7}$$

$$f.) \frac{f(x)}{g(x)} = (4x^2 - 3x) \div \frac{4}{2x-7}$$

$$= (4x^2 - 3x) \times \left(\frac{2x-7}{4}\right)$$

$$= \frac{8x^3 - 28x^2 - 6x^2 + 21x}{4}$$

$$= \frac{8x^3 - 34x^2 + 21x}{4}$$